2-channel PRE/REC amplifier with auto-tracking interface
BA7182AS

The BA7182AS is a PRE/REC amplifier developed for use in video cassette recorders. It has been designed for use in two-head decks and features built-in FB damping, two preamplifiers, a chroma output amplifier, an FM output amplifier (with AGC), an envelope detector, a constant-current BTL-drive REC amplifier (with AGC) and built-in channel and REC/PB switches on a single monolithic IC.

●Applications
VCRs

●Features
1)The playback amplifier has a total gain of 59dB (Typ.), and has a low-noise preamplifier. Designed for VHS-band operation with low external parts count. The IC has 2 circuits for 2-head VCR applications.
2)Two playback output systems (through output and AGC output). The AGC output level is 270mV$_{P-P}$ (Typ.); suitable for FM brightness signal output.
3)Auto-tracking interface for automated tracking adjustment. An integrate and hold detector is used to reduce the load on the microcontroller.
4)The recording amplifier uses constant-current BLT drive that handles load variations (i.e. head impedance) well, and gives stable recording characteristics. A single circuit is provided for 2-head VCR use.
5)Built-in recording level AGC means adjustment of FM recording current is not necessary.
6)Head switches for 2-channel PRE/REC system provided.
7)Operates off a single 5V power supply, with low power dissipation.

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Applied voltage	V_{CC}	7.0	V
Power dissipation	Pd	1100 *	mW
Operating temperature	Topr	−20~75	℃
Storage temperature	Tstg	−55~125	℃

* Reduced by 11mW for each increase in Ta of 1°C over 25°C (free air).

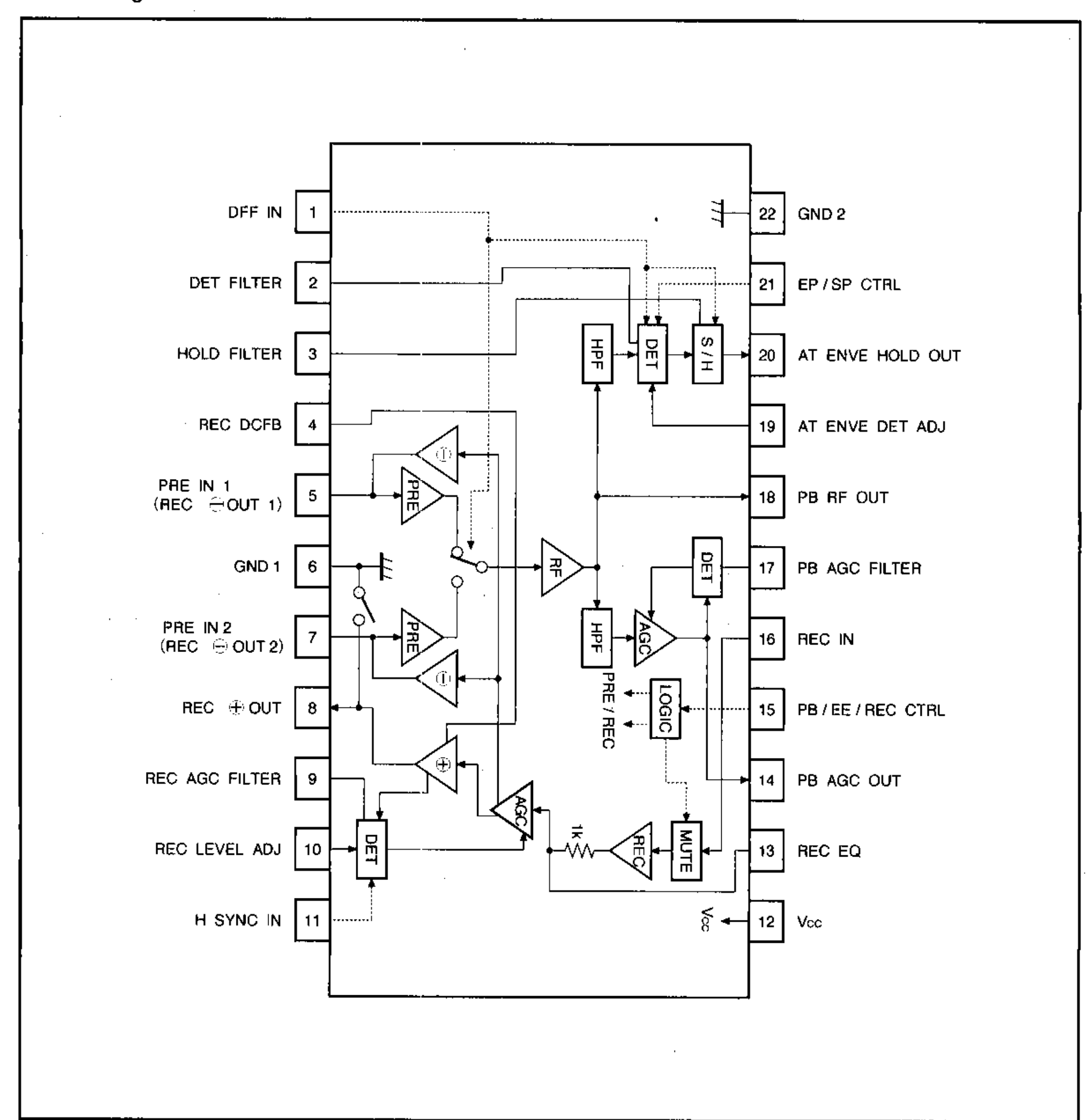
●Recommended operating conditions (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Playback/recording	V_{CC}	4.5	5.0	5.5	V	12pin

◎ Not designed for radiation resistance.



● Block diagram



●Electrical characteristics (Unless otherwise specified, Ta=25℃, Vcc=5.0V and f=4.0MHz)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	Measurement Circuit
〈Playback system〉						Pin 15: H	
Quiescent current	$I_{Q(P)}$	—	26	42	mA	No signal	Fig.1
Voltage gain CH-1	G_{VP1}	56.5	59	61.5	dB	Pin 5 input = 0.3mVP-P, pin 1: L, pin 18 output measurement	Fig.1
Voltage gain CH-2	G_{VP2}	56.5	59	61.5	dB	Pin 7 input = 0.3mVP-P, pin 1: H, pin 18 output measurement	Fig.1
Voltage gain differential	ΔG_{VP}	−1	0	1	dB	$\Delta G_{VP}=G_{VP1}-G_{VP2}$	Fig.1
Frequency characteristic	ΔG_{VI}	−6	−3	−1	dB	Difference in pin 18 output level for f = 8.0/1.0MHz, V_{IN} = 0.3mVP-P	Fig.1
2nd harmonic distortion	$2HD_P$	—	−45	−35	dBc	V_{IN} = 0.3mVP-P, 8.0MHz spurious	Fig.1
3rd harmonic distortion	$3HD_P$	—	−50	−35	dBc	V_{IN} = 0.3mVP-P, 12.0MHz spurious, guaranteed design value.	Fig.1
Maximum output level	V_{OMP}	1.0	1.5	—	VP-P	When pin 18 output 2nd harmonic distortion is -30dBc	Fig.1
Crosstalk	CT_P	—	−38	−33	dBc	Difference in pin 18 output level for pin 1: H/L.	Fig.1
Output DC offset	ΔV_{ODC}	−150	0	150	mVP-P	Pin 18 output DC offset for pin 1: H/L.	Fig.1
Input conversion noise	V_{NIN}	—	0.25	1.0	μVrms	Rg = 10Ω, input conversion of pin 18 output noise, guaranteed design value.	Fig.1
AGC output level	V_{AGC}	220	270	320	mVP-P	V_{IN} = 0.3mVP-P Pin 14 output measurement	Fig.1
AGC control sensitivity	ΔV_{AGC}	—	0.3	2	dB	Pin 14 output level difference for V_{IN} = 0.15 and 0.6mVP-P	Fig.1
AGC frequency characteristic	ΔG_{VAF}	−2	0.5	2	dB	Difference in pin 14 output level for f = 8.0/1.0MHz V_{IN} = 0.3mVP-P.	Fig.1
PB switch ON resistance	R_{ON8}	—	5	10	Ω	Pin 8 impedance	Fig.1
PRE CH 2 threshold voltage	V_{TH1H}	3.5	—	Vcc	V	Pin 1 DC voltage for CH 2 operation	Fig.1
PRE CH 1 threshold voltage	V_{TH1L}	0	—	1.2	V	Pin 1 DC voltage for CH 1 operation	Fig.1
ENVE output level SP-2	V_{EN-S2}	1.4	2.2	3.0	V	Pin 20 output measurement when pin 21 = L and pin 18 output = 250mVP-P	Fig.1
ENVE sensitivity curve	P_{CRV}	150	200	250	%		Fig.1
ENVE saturation voltage	V_{EN-MA}	4.6	4.9	—	V	Pin 21 = L, Pin 20 output measurement for large signal	Fig.1
ENVE residual voltage	V_{EN-MI}	—	0.1	0.4	V	Pin 21 = L, Pin 20 output measurement for no signal	Fig.1
EP mode threshold voltage	V_{TH21H}	3.5	—	Vcc	V	Pin 21 DC voltage for EP mode	Fig.1
SP mode threshold voltage	V_{TH21L}	0	—	1.2	V	Pin 21 DC voltage for SP mode	Fig.1

●Electrical characteristics (Unless otherwise specified, Ta=25℃, V_{CC}=5.0V, f=4.0MHz and I_{OAR}=36mA_{P-P})

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	Measurement Circuit
〈Recording system〉						Pin 15: L	
Quiescent current	$I_{q\ (R)}$	—	72	108	mA	No signal	Fig.2
Recording AGC level	I_{OAR}	30	36	42	mA_{P-P}	Pin 16 input = 400mV_{P-P}, pin 8 output measurement	Fig.2
AGC control sensitivity	ΔI_{OAR}	—	0.15	2	dB	Pin 8 output level difference for f = 4.0MHz, pin 16 input = 225mV_{P-P} and 800mV_{P-P}.	Fig.2
AGC frequency characteristic	ΔI_{OAF}	−2	0	2	dB	Pin 8 output level difference for f = 8.0/1.0MHz, pin 16 input = 400mV_{P-P}	Fig.2
2nd harmonic distortion	$2HD_R$	—	−41	−35	dBc	Pin 16 input = 400mV_{P-P}, 8.0MHz spurious.	Fig.2
3rd harmonic distortion	$3HD_R$	—	−50	−40	dBc	Pin 16 input = 400mV_{P-P}, 12.0MHz spurious, guaranteed design value.	Fig.2
Cross modulation distortion	CMD_R	—	−43	−38	dBc	4.0MHz ± 630kHz spurious, guaranteed design value.	Fig.2
Maximum output level	I_{OMR}	42	50	—	mA_{P-P}	When pin 8 output 2nd harmonic distortion is -30dB	Fig.2
Recording current load characteristic	ΔI_{ORL}	−2	−0.35	—	dB	Pin 8 output level difference for load L: 8.2 ~ 12 μH	Fig.2
Mute attenuation ratio	MU_R	—	−44	−38	dBc	Pin 8 output level difference for pin 15: M/H.	Fig.2
Frequency characteristic	ΔI_{OEQ}	−5.3	−7.8	−10.3	dB	Pin 8 output level difference for f = 8.0/1.0MHz, AGC OFF	Fig.2
AGC mode threshold voltage	V_{TH11H}	2.7	—	V_{CC}	V	Pin 11 DC voltage to maintain recording AGC operation	Fig.2
$\overline{\text{AGC}}$ mode threshold voltage	V_{TH11L}	0	—	1.2	V	Pin 11 DC voltage to maintain recording AGC stopped	Fig.2
PB mode threshold voltage	V_{TH15H}	3.8	—	V_{CC}	V	Pin 15 DC voltage for PB mode	Fig.2
EE mode threshold voltage	V_{TH15M}	2.2	—	2.8	V	Pin 15 DC voltage for REC MUTE mode	Fig.2
REC mode threshold voltage	V_{TH15L}	0	—	1.2	V	Pin 15 DC voltage for REC mode	Fig.2

* Note: dBc: dB below carrier (used to express relative level from carrier reference for convenience sake)

●Measurement circuit
Playback system

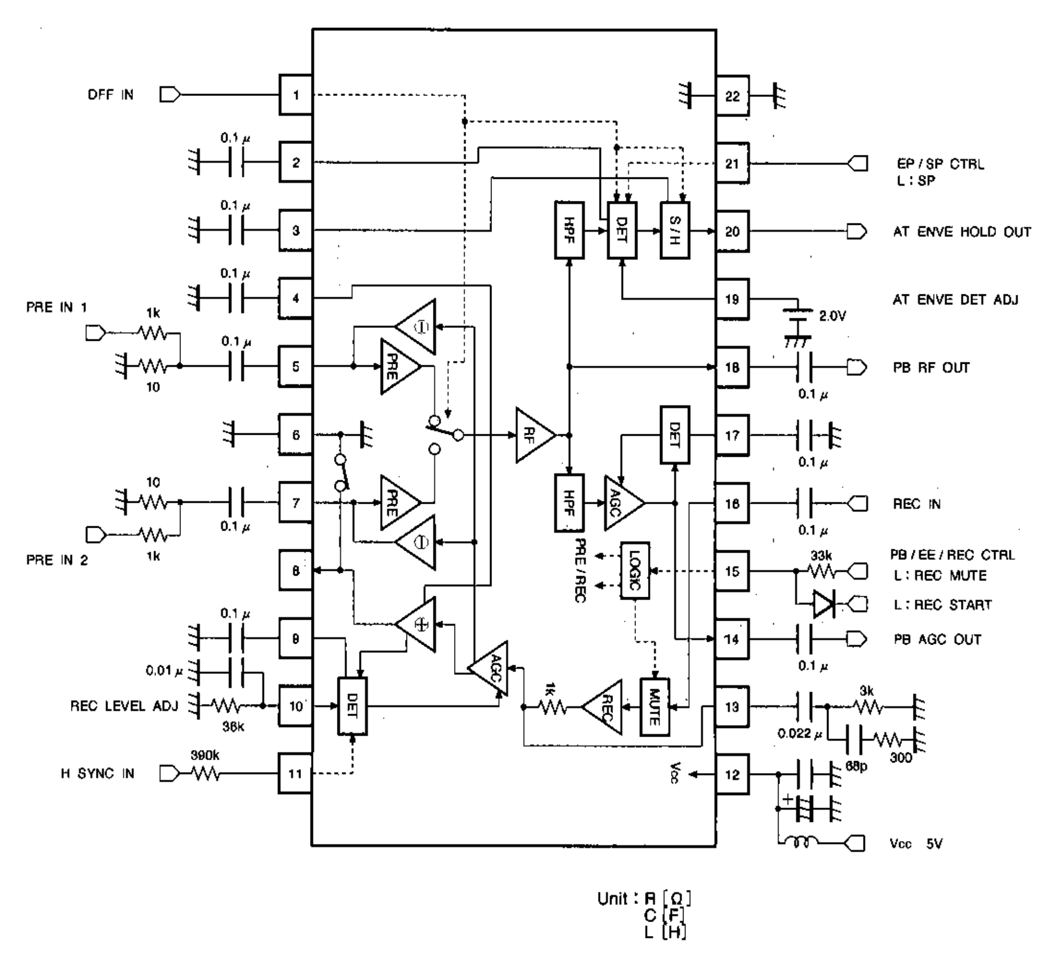


Fig.1

Recording system

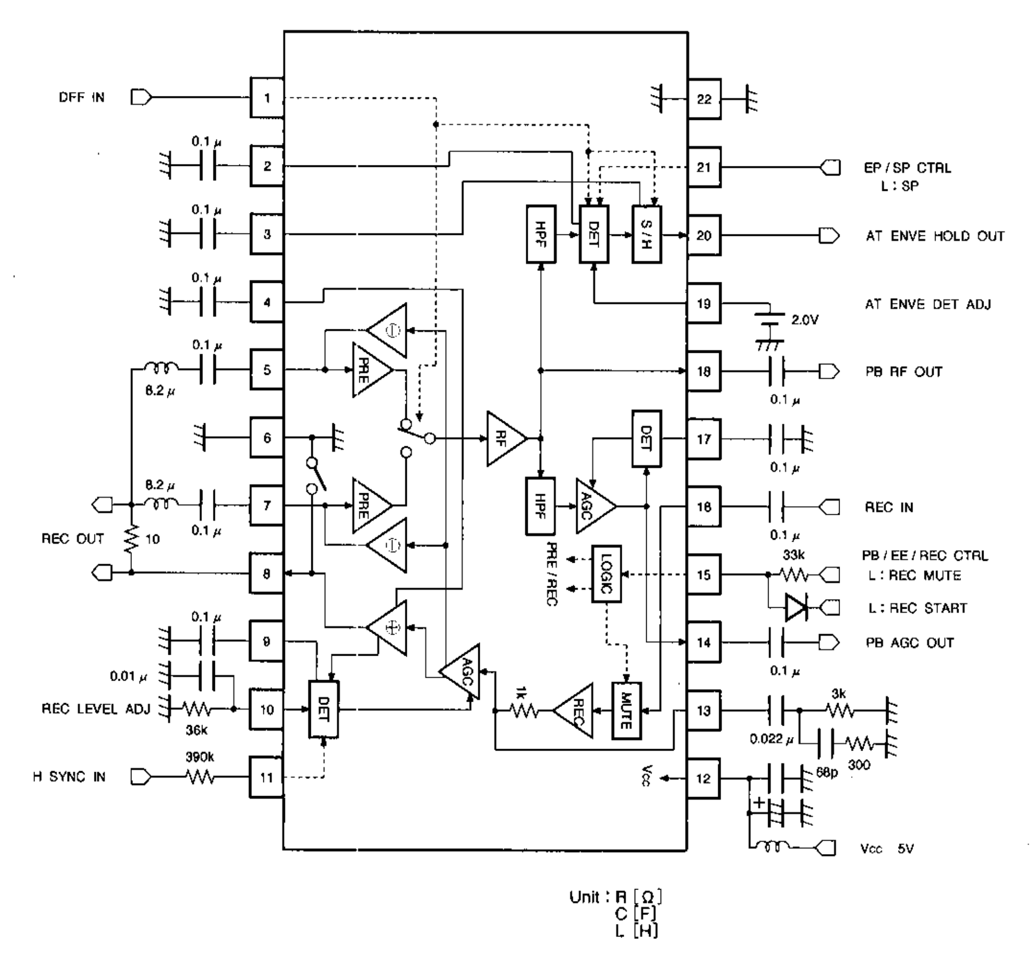


Fig.2

●Control mode table

(1) DFF IN (pin1)

・Playback input selection (head switching)

・Playback output envelope detection timing control (integrate and hold one frame)

Control pin	Function		Control voltage V_{CTRL1} [V]
DFF IN	Selected playback input	Envelope detect	
H	CH2 (PRE IN2 7pin)	Reset on rising edge	3.5 ~ Vcc
L	CH1 (PRE IN1 5pin)	—	0.0 ~ 1.2

(2) H SYNC IN (pin11)

・Controls recording AGC detector block operation.

Control pin	Function	Control voltage V_{CTRL11} [V]
H SYNC	AGC detect	
H	ON	2.7 ~ Vcc
L	OFF	0.0 ~ 1.2

(3) PB/EE/REC CTRL (pin15)

・Playback/recording mute/recording mode switching

Control pin	Mode	Function				Control voltage V_{CTRL15} [V]
PB/EE/REC		PRE AMP	AT ENVE	REC MUTE	REC AMP	
H	PB	ON	ON	OFF	OFF	3.8 ~ Vcc
M	REC MUTE	OFF	OFF	ON	ON	2.2 ~ 2.8
L	REC	OFF	OFF	OFF	ON	0.0 ~ 1.2

・Pin 15 is pulled up to Vcc via a 33kΩ resistor.

(4) EP/SP CTRL (pin21)

・Switching for the detector gain of the playback envelope detector

Control pin	Function	Control voltage V_{CTRL21} [V]
EP / SP	AT ENVE gain	
H	Typ.+6dB	3.5 ~ Vcc
L	Typ.	0.0 ~ 1.2

・Pin 21 is pulled up to Vcc via a 50kΩ resistor.

●Application example

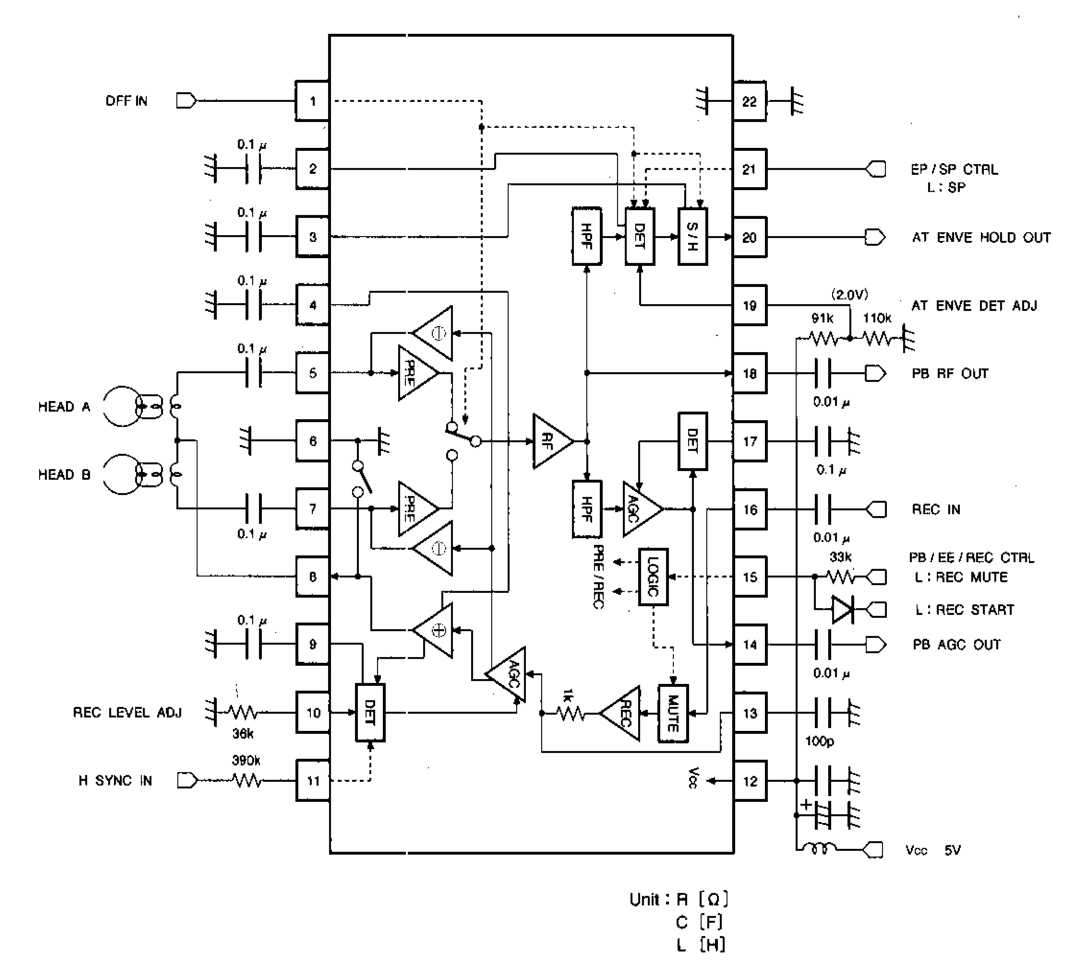
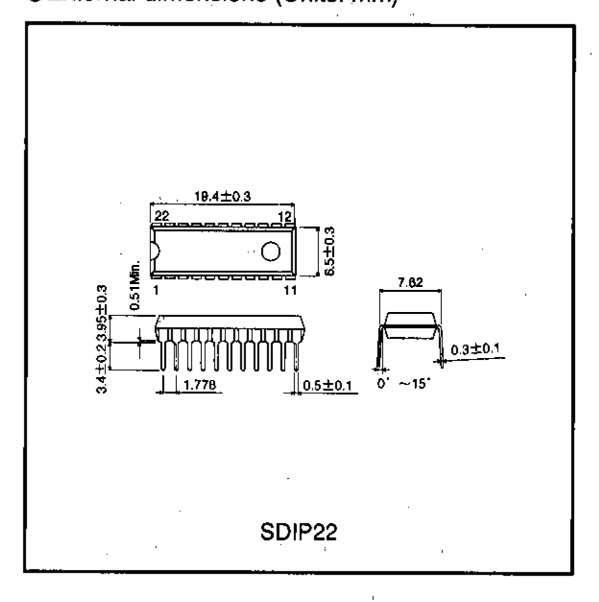


Fig.3

●External dimensions (Units: mm)



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